price rise. If accommodation is the best policy, then the sharp rises in unemployment following past OPEC price increases indicate that the Federal Reserve's policy has been too tight. 2/

Macroeconomic Policy in Germany and Switzerland: Few Lessons for the United States. It is often asked why Germany and Switzerland have fared better than the United States even though they rely almost entirely on OPEC for their energy needs. Both have had exchange rates rising against the dollar, and both have experienced lower unemployment and inflation rates than the United States.

Swiss and German monetary authorities were able to control inflation and raise the value of the franc and the deutsche mark by pursuing very restrictive credit policies. These policies reduced employment in Switzerland and Germany just as they would have in the United States. But the rise in measured unemployment was small, because unemployed women left the labor force and unemployed "guest workers" left the country. Had officially measured unemployment included those workers, the statistics would have shown more clearly the employment consequences of restrictive credit policies: the measured unemployment rate would have tripled.

2/ Gramlich, Phelps, and Solow conclude that the best macroeconomic policy would partially or completely accommodate an oil price rise. ("Complete accommodation" implies monetary or fiscal expansion sufficient to keep unemployment from rising.) Gordon argues for accommodation when wages and prices are not flexible. Problems arising from macroeconomic accommodation are discussed by Fellner (in his response following the Gramlich article) and by Feldstein and Poole (in their discussion of the Gordon article). Edward Gramlich, "Macro Policy Response to Price Shocks," Brookings Papers on Economic Activity (1979:1), pp. 125-166, especially p. 166; Edmund S. Phelps, "Commodity Supply Shock and Full-Employment Monetary Policy," Journal of Money, Credit, and Banking (May 1978), pp. 206-221, especially p. 215; Robert Solow, "What to Do (Macro-economically) When OPEC Comes" (Department of Economics, Massachusetts Institute of Technology, July 1978; processed), pp. 19-21; Robert J. Gordon, "Alternative Responses of Policy to External Supply Shocks," Brookings Papers on Economic Activity (1975:1), pp. 183-206.

In Germany, restrictive credit policies permitted the deutsche mark to remain steady relative to the dollar between 1973 and 1975 and then to appreciate between 1975 and 1978. These policies also achieved a relatively low increase of 15.1 percent in the consumer price index (Table 16) in the face of a rise in unemployment to 4.5 percent, still a relatively low rate among Western countries.

The German unemployment rate rose from 2.6 percent to 4.5 percent between 1974 and 1977. Had 450,000 "guest workers" not left the country, though, the unemployment rate would have been about 6.4 percent (Table 16), which would have exceeded the previously recorded cyclical peak of 4.9 percent in 1955. 3/ Such a rise in unemployment can only reflect a restrictive policy unprecedented in the recorded history of postwar Germany.

In addition, in contrast to a rise in the U.S. labor force participation rate, labor force participation in Germany declined from 54.4 percent to 52.8 percent. Had those 768,000 workers been unemployed, as opposed to dropping out of the labor force, the German unemployment rate would have been nearly 10 percent. 4/

Most of the Swiss experience is inapplicable for similar reasons. Between 1974 and 1977, the Swiss franc appreciated relative to the dollar, while the Swiss consumer price index

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3/ OECD Economic Outlook (December 1978), p. 12. The peak rate for each country was calculated over the period 1955 to 1973.

4/ Labor force participation rates taken from Joyanna Moy, "Recent Labor Market Trends in Nine Industrial Nations," U.S. Department of Labor, Monthly Labor Review (May 1979), pp. 8-16. The same source gives a total German labor force of 25.34 million in 1977, with a participation rate of 0.528; had the participation rate been 0.544, as it was in 1973, the labor force would have been 26.11 million, or 0.77 million more than it was. The drop in labor force participation plus the guest-worker emigration total about 1.2 million workers, compared with a 1.0 million total unemployment count. Germany had the largest decline in its labor force participation rate of nine Western countries studied. In contrast, the labor force participation rate in the United States rose from 61.2 percent to 62.3 percent in the same period.

TABLE 16. CHANGES IN UNEMPLOYMENT RATES AND CONSUMER PRICES IN THE UNITED STATES, GERMANY, AND SWITZERLAND

	United States		Germany		Switzerland	
	1974	1977	1974	1977	1974	1977
Guest Workers (thousands)	--	--	2,331.6	1,888.6	598.5	492.8
Registered Unemployed (thousands)	--	--	583.0	1,030.0	0.2	12.0
Unemployment Rate (percent)	5.6	7.1	2.6	4.5	0.001	0.4
Unemployment Rate Including Emigrated Guest Workers (percent)	5.6	7.1	2.6	6.4	0.001	3.5
Consumer Price Index (percentage change from 1974)	--	22.9	--	15.1	--	9.9
Industrial Production (1975 = 100)	110	116	106	110	114	106
Percentage change from 1974	--	5.4		3.8	--	-7.1
Employment (1975 = 100)	101	107	104	99	109	96
Percentage change from 1974	--	5.9	--	-4.8	--	-11.9
GDP, 1975 Prices and Exchange Rates (percentage change from 1974)	--	9.9	--	5.5	--	-5.6

SOURCES: Consumer prices taken from OECD Economic Outlook (December 1978), p. 127. Unemployment and unemployment rate, industrial production, employment, and real GDP data taken from OECD, Main Economic Indicators (December 1978), pp. 18-19, 152. Swiss unemployment rate for 1977 taken from Le Department Federal de L'Economie Publique, La Vie Economique (November 1980), p. 2*; the rate for 1974 computed from Swiss unemployment (221) and total labor force size (2,943,000) given in OECD Economic Survey: Switzerland (March 1976), pp. 1, 17; total unemployment for 1977 taken from Banque Nationale Suisse, Bulletin Mensuel (February 1978). Guest-worker data taken from "Foreign Workers: A Current Inventory," OECD Observer (March 1979), pp. 33-34.

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rose only 9.9 percent. At the same time, however, the Swiss unemployment rate rose from about 0.001 percent to about 0.4 percent. While the total number of unemployed in Switzerland in 1977 was only 12,000, that was historically high by Swiss standards. Over the same period, however, the number of "guest workers" fell by 105,700. Had those workers been counted among the Swiss unemployed, the unemployment rate would have been about 3.5 percent, extraordinarily high by Swiss standards.

In the absence of guest-worker emigration and declines in labor force participation rates, unemployment rates would probably not have risen by as much as is indicated above, since some of the "guest workers" and some of the other workers who dropped out of the labor force undoubtedly could have had jobs. It does, nevertheless, serve to give some notion of how much restrictive policies reduce output.

It is unlikely that the German or Swiss policies would have been politically feasible without the emigration of foreign workers and declines in labor force participation. Had policies in the United States been restrictive enough to reduce total employment by 4.8 percent, as they did in Germany, then the U.S. unemployment rate would have risen to 10.1 percent. Had U.S. policies been restrictive enough to reduce employment by 11.9 percent, as they did in Switzerland, the U.S. unemployment rate would have risen to 16.8 percent. 5/ In the United States, such unemployment

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5/ The comparison between U.S. and foreign unemployment rates is made as follows: If N equals the number of employed workers and L equals the total labor force, then the number of unemployed workers (U) equals L - N, and the unemployment rate is U/L = (L-N)/L. For a given labor force (constant L), the elasticity of the unemployment rate with respect to employment (N) is -[N/(L-N)], or [(U/L)-1]/(U/L). Given an initial unemployment rate of 5.6 percent in the United States, a 1 percent drop in the number of employed workers would produce a 16.8 percent rise in the unemployment rate, increasing the unemployment rate from 5.6 percent to 6.5 percent. For an employment decline of 4.8 percent, like that experienced in Germany, the U.S. unemployment rate would have risen by 80.9 percent, to 10.1 percent; for a decline of 11.9 percent, like that experienced by Switzerland, the U.S. unemployment rate would have risen to 16.8 percent.

rates would present political and economic problems unseen since the 1930s.

There are, finally, many other differences between the economic structures of the United States, on the one hand, and of Germany and Switzerland on the other. 6/ Such differences may explain different levels of unemployment and even different apparent short-term trade-offs between inflation and unemployment. In other ways, not discussed here, Swiss and German practices may suggest improvements for U.S. policy formulation. All this notwithstanding, the United States could have had a lower inflation rate had it been prepared to sustain a fall in employment such as occurred in Germany and Switzerland. But this fact is made less germane by the past ability of Germany and Switzerland to avoid much of the political and economic cost of unemployment by exporting it.

Commercial Policy Options

Oil-importing countries can also offset the demand-reducing effects of an oil price rise by expanding their trade surpluses. The trade surplus increase, moreover, would contribute to exchange rate appreciation, and would partially offset the original inflationary effect of the oil price rise.

International Cooperation Required. But non-OPEC countries cannot all simultaneously increase their trade balances unless OPEC reduces its surplus. Otherwise, when one oil-importing country solves its stagflation problem with an increased trade balance and exchange rate appreciation, another oil-importing country's problems become worse because its trade balance shrinks and its currency depreciates.

6/ A recent study, for example, found greater real wage rigidity in Japan and Europe than in the United States. This suggests that, had the United States pursued as contractionary a monetary policy as did Germany, the drop in U.S. inflation would have been greater, because declines in the real wage would have prevented some of the unemployment in the United States. Jeffrey D. Sachs, "Wages, Profits, and Macroeconomic Adjustment: A Comparative Study," Brookings Papers on Economic Activity (1979:2), p. 271. Sachs also cites other comparative studies (p. 269).

Different national policy approaches and different domestic economic structures, not direct trade with OPEC, explain most of the trade balance changes of the United States and other oil-importing countries between 1973 and 1978. The U.S. trade balance fell by $26.5 billion over this period; only about $10.8 billion of that drop occurred in trade with OPEC (Table 17). The combined trade balance of the other industrialized countries rose by $44.9 billion, while their balance with OPEC fell by $1.1 billion. The trade balance of the rest of the world, excluding OPEC, fell by $45.4 billion; about $29.2 billion of this decline occurred in trade with OPEC.

Despite massive changes in trade balances outside of trade with OPEC, and despite the prior knowledge that all oil-importing countries cannot simultaneously solve their macroeconomic problems with trade promotion, such external policies are coordinated in only a rudimentary way. Nor is it clear that existing international institutions could do much more to coordinate such policies, or that there would be agreement on the economic effects of different patterns of trade balances. It is unlikely, though, that the United States could address its oil-related macroeconomic problems with a trade balance growth like that of Japan. Were the United States to attempt this, its trading partners would require such strong measures to insulate their domestic economies that they would probably undo the Western free trade system.

Is Japan a Good Example? Between 1973 and 1978, the yen rose 54.7 percent against the dollar, while the Japanese unemployment rate rose from 1.3 percent to 2.3 percent--not especially high by Japanese standards. 7/ The increase in the Japanese trade balance of over $20 billion 8/ during that period produced these effects.

Three explanations of Japan's achievement are offered: superior products, marketing, and domestic economic organization; export subsidies and dumping; and import barriers and discrimination.

7/ End-of-year exchange rates taken from IMF, International Financial Statistics (January 1980), p. 220. Japanese unemployment rate taken from Moy, "Recent Labor Market Trends in Nine Industrial Nations," p. 12.

8/ U.S. Department of Commerce, International Economic Indicators (September 1979), p. 46.

TABLE 17. EVOLUTION OF TRADE BALANCES, 1973-1978 (Billions of dollars)

	Trade Balance			Changes in Trade Balance		
	1973	1975	1978	1975 Over 1973	1978 Over 1975	1978 Over 1973
Total Trade						
United States a/	3.2	16.7	-23.3	13.5	-40.0	-26.5
Other industrial countries b/	12.1	18.1	55.9	6.0	37.8	43.8
OPEC	19.3	53.9	47.4	34.6	-6.5	28.1
Rest of the world c/	-34.6	-88.7	-80.0	-54.1	8.7	-45.4
Trade with OPEC						
United States	-2.1	-8.0	-12.9	-5.9	-4.9	-10.8
Other industrial countries	-12.1	-26.7	-13.2	-14.6	13.5	-1.1
Rest of the world	-5.1	-19.2	-21.3	-14.1	-2.1	-16.2
Trade Excluding OPEC						
United States	5.3	24.7	-10.4	19.4	-35.1	-15.7
Other industrial countries	24.2	44.8	69.1	20.6	24.3	44.9
Rest of the world	-29.5	-69.5	-58.7	-40.0	10.8	-29.2

SOURCE: Regional trade flows are taken from International Monetary Fund, Direction of Trade Yearbook, 1979. To avoid problems of inconsistency between export and import data, only export data were used to construct the trade tables.

a/ Replaces IMF data on U.S. imports from OPEC (of $4.6 billion, $13.3 billion, and $28.9 billion for 1973 to 1978) with larger figures representing about 77 percent of total U.S. imports of petroleum and petroleum products. U.S. net imports of petroleum and petroleum products amounted to $7.1 billion, $23.9 billion, and $37.5 billion in 1973, 1975, and 1978, respectively. (See U.S. Department of Commerce, Survey of Current Business (March 1979), p. S-23; U.S. Department of Commerce, Business Statistics, 1977, pp. 111, 115.) A great deal of imported refined petroleum comes indirectly from OPEC through offshore refining centers and is not reported as an import from OPEC. But when OPEC raises the oil price, the United States would pay, and OPEC would receive, the bulk of increased revenue; the intermediate refiner would retain little of the increase. This table makes a rough correction for this problem by attributing to OPEC member countries all oil imports from those countries in Central America and the Caribbean where oil production is zero. Such imports amounted to about 10 percent of total U.S. imports in 1979 and raised total imports from OPEC to 77 percent of total U.S. imports of petroleum and petroleum products. (See U.S. Department of Energy, "Supply, Disposition, and Stocks of All Oils by P.A.D. Districts and Imports in the United States, by Country" (December 1979), p. 8; U.S. Department of Energy, International Petroleum Annual, 1978, p. 16.)

b/ Includes Austria, Belgium, Canada, Denmark, France, Germany, Italy, Japan, Netherlands, Norway, Sweden, Switzerland, and the United Kingdom.

c/ Excludes the United States, other industrial countries, and OPEC member countries; includes the developing countries, some smaller European countries, Australia, New Zealand, and South Africa.

Much qualitative evidence supports the view that superior products, marketing, and trading organizations explain the rapid growth of the Japanese surplus. If Japanese companies perform better with techniques that U.S. companies could profitably use, then U.S. citizens would be better off if U.S. companies adopted them. In some cases, there might be social gains if the U.S. government accelerated adoption of these techniques.

But the drop in Japanese real imports gives some support to the view that trade restrictions may explain the rise of the Japanese surplus. Quite unusually, Japanese real imports fell despite a rise in Japanese GNP and a fall in import prices. If trade restriction explains Japan's trade surplus, then adopting Japanese production methods will not help the United States--but negotiation and retaliation might.

The rise in the Japanese share of world exports, despite the worsening of most indicators of Japanese international competitiveness, is also perplexing. The increase in share of world exports is consistent with superior products and marketing, but it is also consistent with the use of credit and merchandise subsidies and with dumping.

Because the U.S. economy is so much larger than Japan's, intensive reliance on trade policy to achieve U.S. macroeconomic goals would disrupt world trade. With respect to other commercial issues, only better explanations of Japan's trading success can determine whether the United States should emulate the Japanese or take issue with them.

Fiscal Policy Coordinated with Monetary Policy

When inflation is caused by an external shock, such as an oil price increase, the social costs of the adjustment could be lessened by aiming monetary policy at reducing inflation while aiming fiscal policy at maintaining output and employment. The result would be lower inflation and less unemployment than would otherwise be obtained.

A full treatment of such a coordinated fiscal and monetary policy cannot be presented here, but one example serves to illustrate the case. A combination of an expansionary fiscal policy and a restrictive monetary policy could simultaneously expand GNP while restricting credit markets and raising interest rates and exchange rates. The exchange rate appreciation might offset part

of the inflationary effect of the oil price rise by reducing the dollar prices of U.S. imports and exports. The obverse policy--easing monetary policy to expand output while tightening fiscal policy to reduce inflation--would slacken credit markets, resulting in falling interest and exchange rates. The exchange rate depreciation might aggravate the inflationary impact of the oil price rise.

Some economists believe it would be ineffective to address monetary and fiscal policies to different objectives, such as inflation and unemployment. They argue that economic slack governs the rate of inflation, and that monetary and fiscal policy both act on the inflation rate solely by changing the amount of slack. In such an environment, monetary and fiscal policy would not have different effects on employment and inflation.

Oil Price Controls

Unless OPEC lowers its price, no oil-importing country can improve the economic well-being of all its citizens by holding the domestic price below the OPEC price. Obviously, if it were possible to do so, then oil-importing countries should just reduce oil prices to zero. Oil price controls cannot permanently increase the economic well-being of all citizens of a country because taxpayers, as a group, must pay the difference between the controlled price and OPEC's price.

But a price control program that permitted the domestic oil price to rise to the new OPEC price more slowly than the rate at which the OPEC price increases might improve short-term macroeconomic choices. Thus, although OPEC might raise the oil price over the course of a few weeks, macroeconomic policy might be better served if the domestic price rose to the new OPEC price more slowly, over a longer period. (This could be achieved by subsidizing all oil imports, letting the subsidy shrink at the rate necessary to achieve the desired rate of domestic price increase.)

Several studies have explored the best monetary and fiscal policy response to a one-time, permanent rise in the oil price. 9/

9/ Gordon, "Alternative Responses of Policy to External Supply Shocks"; Gramlich, "Macro Policy Response to Price Shocks"; Phelps, "Commodity Supply Shock and Full-Employment Monetary Policy"; and Solow, "What to Do (Macroeconomically) When OPEC Comes."

But none seems to have considered the most appropriate monetary and fiscal policy when oil price controls slow the rate at which the domestic oil price reaches the OPEC price. If a gradually rising oil price reduced the costs of unemployment and inflation, the macroeconomic gains might outweigh the costs of the subsidy.

Wage and Price Controls

Wage and price controls cannot succeed in the face of overly expansive monetary or fiscal policies. But such controls might help dampen the spread of inflation caused by a clearly external shock such as an OPEC price increase. One appropriate response might be for labor and industry groups with market power to attempt to maintain their real wages and profits at the expense of those groups without such power. Moreover, since oil price increases raise the U.S. general price level more than the price levels of other major oil-importing countries, the importance of external pressures on costs has increased more in the United States than it has in other countries. For this reason, the attractiveness of wage and price controls, aimed directly at containing such cost increases, may have increased relative to other policy options more in the United States than in other countries.

Use of Tax and Transfer Policy to Maintain Real Income

Where wage settlements reflect workers' attempts to maintain real wages, policymakers might secure lower nominal wage increases by cutting taxes (or increasing transfer payments) in order to offset the drop in real after-tax income that follows from the OPEC price rise. As explained above, the full-employment real after-tax income of the present generation cannot be maintained without reducing the full-employment after-tax disposable income of future generations. If the government undertook such tax or transfer policies, the rise in the government budget deficit would also appear either as a drop in savings and investment (passing on a smaller domestic capital stock to future generations) or as a drop in the current account (passing on a smaller foreign asset position or a larger foreign debt).

But some policies might increase the potential real income of both generations. For example, suppose that adjusting the current generation's after-tax income to the full OPEC price rise produced higher wage demands and additional inflationary pressure, and that policymakers combated this higher inflation with more

restrictive policies that created higher unemployment. Suppose further that tax cuts would have moderated these wage demands. Then policymakers would have to weigh the effect of the tax cut in passing on a reduced net worth to future generations against the effect of unemployment, which reduces current output below potential levels, thereby also reducing savings, investment, and the net worth passed on to future generations. Proper policies might call, therefore, for deferring some reduction of real after-tax income when oil prices rise. Moreover, so long as OPEC maintains a surplus, all industrial countries could pursue such policies simultaneously. 10/

Labor Market Programs

When periodic OPEC price increases are added to the other factors that spur inflation, a macroeconomic policy aimed at maintaining the same inflation target will produce a larger amount of unemployment if the effectiveness of labor markets does not improve. If, however, there are economies of scale in changing labor market regulations 11/ or in operating programs aimed at improving labor market efficiency, the social rates of return on such programs will rise, relative to what they were before, as a result of OPEC price increases. Such programs might, then, merit enlargement. Moreover, since the U.S. general price level rises more with oil price increases than do the general price levels in other major industrial countries, the returns on such programs may have risen in the United States relative to the returns in other countries. Such programs might then warrant more rapid development in the United States relative to other countries.

Lowering the OPEC Oil Price

If OPEC were to stop raising the world oil price, or to reduce it relative to other prices, the problems discussed above

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10/ For a discussion of the macroeconomic implications of attempts by workers to maintain real wages, see Solow, "What to Do (Macroeconomically) When OPEC Comes," and Sachs, "Wages, Profits, and Macroeconomic Adjustment."

11/ Since regulations typically affect classes of unemployed workers, and since the cost of changing a regulation generally does not vary with the number of affected people, there will usually be economies of scale in changing regulations.

would be alleviated. Whether this is desirable, or possible, is the subject of the following section.

THE MACROECONOMIC COSTS OF A HIGH OIL PRICE

Were the oil price to stop rising, its effects on inflation and real GNP would abate. GNP would return to full-employment levels, and oil-related increases in aggregate price indexes would cease. But even without these costs, the burden of high oil prices would remain.

In what sense can it be said that the price of oil is too high? The price is too high if it leads consumers to reduce inefficiently their present consumption of oil in favor of consumption by future generations. The price of oil should reflect its natural scarcity rather than the market power of the producing countries. Too low an oil price would permit the world to deplete its oil reserves before oil substitutes had been developed and energy demand had fallen. Too high an oil price, on the other hand, would leave substantial amounts of oil in the ground long after the high oil price had promoted the development of oil substitutes and reduced energy demand.

Were OPEC charging a price that properly rationed oil for future generations in oil-consuming countries, then reducing that price would not appropriately solve the foregoing macroeconomic problems. The rise in the oil price would reflect an unfortunate but unavoidable constraint in economic growth resulting from fixed available natural resources.

But most estimates indicate that OPEC charges a price far greater than is warranted by the underlying scarcity of oil, far higher than necessary to move efficiently to the energy base of the 21st century. OPEC is a cartel. As such, it can charge a price designed to maximize the wealth of its members at the expense of the rest of the world. Estimates of the competitive price of oil--the price warranted by oil's underlying scarcity--ranged between $5 and $16 per barrel in 1979. 12/ Given

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12/ Nordhaus sets the 1979 competitive price at about $3.50, expressed in 1975 dollars. CBO estimates that the price in 1979 dollars is 35 percent higher based on the rise in the Consumer Price Index between 1975 and 1979. (William

the 1979 cartel price of $24 per barrel, the excessive price charged by OPEC was $8 to $19 per barrel. The total transfer to OPEC unjustified by oil's scarcity ranged between $65 billion and $150 billion in 1979 for the OECD countries; for the United States alone, the unjustified transfer was $25 billion to $75 billion. 13/

Why is the OPEC Price a Burden?

Excessively high OPEC prices reduce the real standard of living that oil consumers may purchase with their current levels of real production, or GNP. That decline in consumption is the burden of high OPEC prices.

As was discussed in Chapter III, an individual wishing to avoid this decline in his consumption could choose to save less in order to maintain his consumption at its former level. That individual would pass the burden of the oil price increase on to himself in later years, or on to his children through a smaller bequeathed estate. A country can make the same choice. It can

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Nordhaus, The Efficient Use of Energy Resources (New Haven: Yale University Press, 1979), Figure 6.2 and Table 6.5, pp. 108-109.) Marshalla estimates, under a variety of assumptions, that the competitive price between 1986 and 1990 will range between $5 and $12, measured in 1975 dollars. These prices measured in 1979 dollars are also 35 percent higher. (Robert Marshalla, "An Efficient World Price for Oil," Federal Energy Administration, International Analysis Division, Office of Energy Systems Modeling and Forecasting, Office of Data and Analysis (May 24, 1976; processed), p. 2.)

13/ OECD net imports of crude oil and refined petroleum were 1.1 billion metric tons in 1979. (OECD, Quarterly Oil Statistics, Fourth Quarter 1979 (1980: 1), pp. 284-285.) The above text converts data in metric tons to barrels using 7.4 barrels per ton, the average for the United States (p. VIII). The United States imported 8.4 million barrels of crude and refined petroleum per day in 1979. (Central Intelligence Agency, International Energy Statistical Review (August 26, 1980), p. 4.) The above text uses a cartel price of $24.00, the official sales price for Saudi Arabian light crude in December 1979 (p. 21).

borrow from OPEC members to maintain current consumption; its borrowings would appear in the balance of payments as a current account deficit. In later years, the country would either have to repay the debt or have a smaller net foreign asset position: the burden would be passed on to future generations.

The burden of the high oil price cannot be reduced by reducing the trade deficit with OPEC. When a country reduces its imports or increases its exports to pay for more expensive oil, fewer goods remain available for domestic consumption and investment. The present generation then bears the burden of the high oil price; the burden is not erased. If the present generation fails to reduce the trade deficit, then it passes the burden on to future generations; again, the burden is not erased.

Policy Implications

If, as some argue, the oil price is too high, and since it imposes a burden on all oil-consuming countries whether they have trade surpluses or deficits, the oil-consuming countries have a common interest in reducing the OPEC oil price. 14/

One way to reduce the OPEC oil price would be to reduce the demand for Saudi Arabian oil.

The world energy market uses approximately 80 million barrels of oil equivalent per day, of which about nine million are supplied by Saudi Arabia. Because of its huge exports, controlled by a single state seller, Saudi Arabia is the "swing producer" of the OPEC cartel. Other OPEC members need never sell below the Saudi price because they know that Saudi Arabia will refuse to sell below that price and that, without Saudi Arabia, world production would fall far short of world demand. Normally, the process is symmetric: other OPEC members cannot raise their prices much above the Saudi price without risking the loss of their sales to Saudi Arabia. In 1979 and early 1980, Saudi Arabia did not increase its production enough to hold the world oil price at the Saudi price after Iran withdrew from the world market. Saudi Arabian authorities predicted, however, that their production

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14/ They also have an interest in more reliable oil supplies, but this is a separate issue. It is easy to imagine cheap oil supplied unreliably, just as it is easy to imagine excessively expensive oil supplied with great reliability.

level of 9.5 million barrels per day would suffice to bring the spot market price down to the Saudi price by the end of 1980; that appeared to be happening before the Iran/Iraq war. But regardless of what Saudi Arabia does when unforeseen circumstances drive the price above its minimum selling price (and maximum production limits), it will, under present arrangements, always prevent the price from falling below its minimum selling price. In short, Saudi Arabia has acted as the guarantor of the OPEC price.

But suppose, hypothetically, that nine million additional barrels of oil were to arrive on the world market at the current price. Saudi Arabian sales would then fall to zero, as would their revenues; while other OPEC members could maintain sales volume by selling just under the Saudi market price, Saudi Arabia could not do so without, perforce, lowering the cartel price. Therefore, if Saudi Arabia continued to guarantee the cartel price under these circumstances, it would sell nothing. Clearly, Saudi Arabia could not raise its revenues by raising the oil price.

OPEC might try to distribute production cuts among its members in order to guarantee the cartel price, but such production-cutting agreements are difficult to police and typically collapse. Ultimately, Saudi Arabia would have to lower the price to increase its market share, either by driving other suppliers out of the market or by increasing total demand.

The goal of reducing the demand for Saudi oil can be pursued in various ways. Some policies presently in force—conservation, demand reduction policies, and expansion of non-oil energy sources--will reduce the demand for Saudi oil. To the extent that these policies are successful, they all will eventually cut into the Saudi market and moderate the Saudi price.

But other policies, not presently emphasized, may more effectively moderate Saudi pricing. Any barrel of oil produced (or not consumed) outside Saudi Arabia, no matter where, has the same dampening effect on Saudi pricing policy. The expanded production of oil and oil substitutes, or a reduction in energy demand anywhere outside Saudi Arabia, even within OPEC, will reduce the size of the Saudi market at the current price. Even if a reduction in energy demand or an increase in energy supply had no effect on U.S. demand or production, it would still provide incentives for price reduction.

A widely publicized Central Intelligence Agency report, for example, predicted a supply shortfall of 3.2 to 7.7 million barrels of oil per day in 1982 (at mid-1979 prices). This estimate rests on a range of assumptions about OECD income growth and the response of OECD energy demand to price changes. The CIA shortfall estimate assumes Saudi Arabia's preferred production level is 8.5 million barrels per day. In the framework outlined above, maintenance of mid-1979 prices through 1982 would require a rise in Saudi production to between 11.7 and 16.2 million barrels per day, given all the other CIA assumptions. 15/

But there is great uncertainty in these assumptions, more than is reflected in the range of OECD income growth and energy demand assumptions. Uncertainty also exists about energy production and consumption among other blocs of countries, including the other OPEC members. If one applies the same degree of uncertainty to these other countries' production and consumption levels as the CIA applies to those of the OECD, the range of uncertainty around the CIA's shortfall estimate widens. Indeed, at the lower extreme, consistent application of the CIA's own uncertainty intervals implies that the market for Saudi crude would be less than 1 million barrels per day in 1982. Moreover, as the forecast moves further into the future, the interval of uncertainty increases. 16/

Should the market for Saudi oil shrink dramatically, Saudi Arabia could not continue to serve as the swing producer in the cartel. It would have to secure production agreements among OPEC members to widen its market. If such agreements broke down, as they typically have in the past, Saudi Arabia would have to lower its price in order to increase its market share and raise its revenues.

Market conditions consistent with dramatic declines in the OPEC price are within the present error of the forecast. Policies aimed more directly at reducing the Saudi market would increase the probability of such a price reduction.

15/ Central Intelligence Agency, National Foreign Assessment Center, The World Oil Market in the Years Ahead, ER 79-10327U (August 1979), Table 10, p. 12. The shortfall estimate comes from Table 10, page 12; the estimate of desired Saudi production is shown in Table 5, p. 5.

16/ See Appendix F for the details underlying this calculation.

APPENDIXES

APPENDIX A. MEASURING THE RELATIVE IMPACT OF OIL PRICE CHANGES ON U.S. AND FOREIGN GNP DEFLATORS AND CONSUMPTION EXPENDITURES DEFLATORS

EFFECT OF OIL PRICE INCREASES ON THE GNP DEFLATOR

To understand essentially how oil price changes affect the GNP deflator, unobscured by the complexities of actual index numbers, consider a simple geometrically weighted price index. If "P_o" is the price of oil, "P_{no}" is the price of non-oil products, and "A" is the value of oil production relative to GNP in the base period, then the GNP deflator in the United States would be

$$(1) \qquad P_G = P_o^{A} P_{no}^{(1-A)}$$

Denoting percentage change with a dot, the rise in the GNP deflator would be

$$(2) \qquad \dot{P}_G = A\dot{P}_o + (1-A)\dot{P}_{no}$$

Representing the elasticity of nonenergy prices with respect to energy prices as "K," so that $\dot{P}_{no} = K\dot{P}_o$, expression (2) can be rewritten as

$$(3) \qquad \dot{P}_G = [A + (1-A)K]\dot{P}_o$$

The value of "K" will not fall below zero when energy is a gross substitute for other products; it will not exceed one if the relative price of energy is to rise. Given these bounds on "K," the change in the U.S. GNP deflator will range between

$$(4) \qquad A\dot{P}_o < \dot{P}_G < \dot{P}_o$$

Where passthrough of oil prices into non-oil prices is zero, the relative responsiveness of GNP deflators to oil price changes in two countries will depend entirely on relative shares of oil in production. The deflator for a foreign country is derived the same way as shown in expression (3). Denoting the foreign country

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with a lower-case "g," "a," and "k," the ratio of the percentage change in the U.S. GNP deflator to the foreign GNP deflator, when K = k = 0, is

$$(5) \qquad \frac{\dot{P}_G}{\dot{P}_g} = \frac{A}{a}$$

For several tables in the text, it is more informative to express weights in terms of their components of quantity of oil (Q) and real GNP (Y). The price of oil drops out because it is assumed to be set in the world market and be equal across countries, net of tax. 1/

$$(6) \qquad \frac{\dot{P}_G}{\dot{P}_g} = \left[\frac{\dot{P}_o Q_A}{Y_A}\right]\left[\frac{Y_a}{\dot{P}_o Q_a}\right] = \left[\frac{Q_A}{Q_a}\right]\left[\frac{Y_a}{Y_A}\right]$$

If the passthrough of oil prices into non-oil prices in country "A" equals that in country "a," but is not zero, then an

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1/ This assumes away the effect of the U.S. crude oil and natural gas price control programs. These calculations ignore the effects because they are complex; because, to a great degree, they will not affect the application of this analysis to future periods when controls are relaxed; and because substantial evidence indicates that the U.S. price control program affected crude oil prices, not the petroleum product prices that enter the deflators. Moreover, control programs have ambiguous effects on the rate of inflation: while they depress the price below the price that would otherwise have existed, they may permit the price to rise more rapidly than it would have over some periods of time within the control program. C.E. Phelps and R.T. Smith, "Why Decontrol Will Not Raise Petroleum Prices" (Santa Monica: The Rand Corporation, December 1975); C.T. Rousch, Jr., "Effects of Federal Price and Allocation Regulations on the Petroleum Industry," Federal Trade Commission Staff Report R-6-15-33 (December 1976), pp. 38-44; "An Interview with Economist Kenneth Arrow," Forbes (February 4, 1980), p. 49.

oil price rise will still have a greater effect on the deflator in the country in which domestic production is larger relative to GNP. The effects will no longer be in strict proportion to the two countries' weights of oil in GNP, however.

From (3), the ratio of the two prices will be

$$(7) \qquad \frac{\dot{P}_G}{\dot{P}_g} = \frac{A + (1-A)K}{a + (1-a)k}$$

If $K = k$, and $A > a$, then

$$(8) \qquad \dot{P}_G > \dot{P}_g$$

Where passthrough is the same, then, the ratio of increase in the GNP deflator of country "A" to that of foreign country "a" will fall in the range

$$(9) \qquad \frac{A}{a} \geq \frac{\dot{P}_G}{\dot{P}_g} \geq 1$$

EFFECT OF OIL PRICE INCREASES ON THE PERSONAL CONSUMPTION EXPENDITURES (PCE) DEFLATOR

Constructing the PCE deflator involves the same general procedure as with the GNP deflator, but the weights differ. The weight, "B," for the United States would be the value of total oil consumption in total consumption during the base year. The passthrough of an oil price change into the prices of other consumer goods could be "C," where $P_{no} = CP_o$. Then, as in (1),

$$(10) \qquad P_C = P_o^B P_{no}^{(1-B)}$$

As in (7), the percentage change in the consumption expenditures deflators of country "A" relative to country "a" would be

$$(11) \qquad \frac{\dot{P}_C}{\dot{P}_c} = \frac{B + (1-B)C}{b + (1-b)c}$$

As in (9), where passthrough is the same in the two countries, and where $B > b$, the change in the consumption expenditures deflator after an oil price rise will lie in the range

$$(12) \qquad \frac{B}{b} \geq \frac{\dot{P}_C}{\dot{P}_c} \geq 1$$

Where passthrough is zero, it is sometimes useful to express the relative impact in terms of the components of the weights--the quantity of oil consumed (Q) and real consumption (C_B and C_b).

$$(13) \qquad \frac{\dot{P}_C}{\dot{P}_c} = \frac{B}{b} = \left[\frac{\dot{P}_o Q_B}{C_B}\right]\left[\frac{C_b}{\dot{P}_o Q_b}\right] = \left[\frac{Q_B}{Q_b}\right]\left[\frac{C_b}{C_B}\right]$$

Expression (13) assumes that retail oil product prices are equal across countries. That assumption, in turn, ignores the effects of differences in energy taxes. Differences in energy taxes reinforce the finding of this section: OPEC price increases have a greater effect on the U.S. consumer price level.

The expression also ignores differences in petroleum product prices (excluding taxes). The expression does this for the same reasons as were given for ignoring differences in producer prices in the GNP deflator comparisons: the price control program has effects on inflation that are not within the purview of this paper; these effects will decline as the price control programs are phased out; and while there is wide agreement that the control program led to lower prices for crude oil, some observers argue

that the absence of effective retail product price controls permitted refiners to charge world market prices to U.S. consumers. In their view, controlling crude oil prices lowered profits of oil extractors and raised profits of refiners, leaving consumer prices about where they would have been without a price control program. 2/

2/ Ibid.

APPENDIX B. HOW EXCHANGE RATE CHANGES AFFECT DOMESTIC OIL PRICES

The text argues that higher taxes on oil products in European countries force any given OPEC price increase to produce a smaller percentage increase in product prices than would occur in a country with a lower energy tax. This discussion seeks to compare actual price rises in the United States and Europe, but the comparison is blurred by three problems: the price data are expressed in dollars, converted at a constant exchange rate; the OPEC oil price is denominated in dollars, so changes in exchange rates produce changes in non-U.S. domestic oil prices; and finally, the level of taxes has changed over this period. The following paragraphs describe how to control for these differences, in order to isolate the effect of OPEC price rises on the home currency prices for petroleum products.

Let "P" be the oil price measured in dollars, let "r" be the exchange rate measuring dollars per unit of foreign currency (so that a rise in "r" would be a dollar depreciation from the point of view of the United States), and let "t" be the home-currency-denominated tax levied on the oil product in the foreign country. Then the oil price in non-dollar terms may be written as:

$$(1) \qquad P_f = \frac{P}{r} + t$$

The percentage increase in the non-dollar retail oil price is

$$(2) \qquad \dot{P}_f = \frac{P}{(P + tr)}\left[\dot{P} - \dot{r}\right] + \frac{tr}{(P + tr)}\left[\dot{t}\right]$$

Expression (2) measures the relation between the observed rate of increase of the non-dollar foreign price of oil and the rates of increase of the OPEC oil price, the domestic tax, and the dollar exchange rate.

As expression (2) indicates, the effects of exchange rate changes can be removed from the data on the observed non-dollar oil product price by adding the percentage exchange rate change times [P/(P + tr)].

The underlying CIA price data do not make this correction, however. Rather, CIA tables convert several years' data on foreign home currency oil prices into dollars at a single dollar exchange rate. But, as expression (2) indicates, converting at a single exchange rate is tantamount to assuming that the exchange rate did not change over the period. Since the exchange rate did in fact change, the CIA procedure does not actually control for the effect of exchange rate change on the foreign home currency oil price.

Tables 3 and 4 in the text first convert the original CIA dollar-equivalent foreign oil prices back into the foreign currency prices using the CIA conversion exchange rate. Table 4 is derived by using expression (2): the effect of the OPEC oil price rise is isolated by adding the (weighted) exchange rate change and subtracting the weighted tax change.